DOCUMENT RESUME

ED 390 908 TM 024 248

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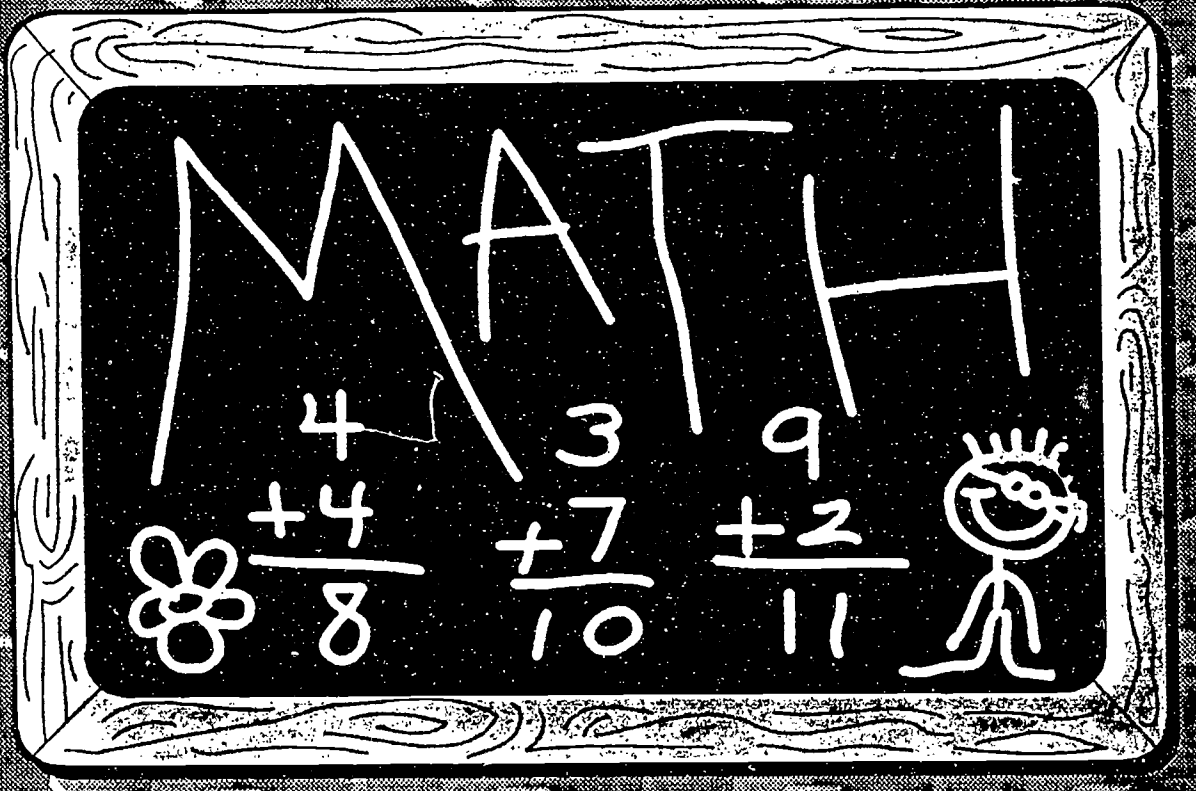
TITLE Title II Final Report, 1993-94.
INSTITUTION Austin Independent School District, Tex. Office of Research and Evaluation.
PUB DATE Sep 94
NOTE 24p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Access to Education; Educational Finance; *Educational Improvement; Elementary Secondary Education; Grants; *Mathematics Instruction; Minority Group Teachers; *Professional Development; Program Evaluation; School Districts; *Science Instruction; Teacher Workshops; *Workshops
IDENTIFIERS *Austin Independent School District TX; *Elementary Secondary Education Act Title II; Hawkins Stafford Act 1988

ABSTRACT

Title II of the Elementary and Secondary Education Act, reauthorized under the Hawkins Stafford Amendments, provides federal funds for the improvement of mathematics and science teaching at all levels of elementary and secondary education, targeting improvement of teacher skills, instructional quality, and student access to instruction. In 1993-94 the Austin Independent School District (AISD) (Texas) received $206,662 from Title II funds, plus carryover for a total of $344,795. A total of 1,034 AISD teachers and administrators attended workshops or conferences sponsored with Title II funds, and this number included an increase in male participants of about 10%. A total of 832 AISD staff members at all levels attended workshops devoted to Title II topics (mathematics and science) in the school year, and others assisted with Title II funds or attended mathematics and science conferences. A mathematics specialist was hired to address school district concerns with middle school and junior high school mathematics underachievement. Based on these evaluation findings, recommendations are presented for continuing funding and participation, with emphasis on minority teacher recruitment and support. (Contains 10 figures and 8 references.) (SLD)

1993-94 Title II Final Report



AUSTIN INDEPENDENT SCHOOL DISTRICT
OFFICE OF RESEARCH AND EVALUATION

1993-94 TITLE II FINAL REPORT
Executive Summary

Austin Independent School District
Office of Research and Evaluation

Author: Jeannine Turner

Program Description

Title II of the Elementary and Secondary Education Act (ESEA) of 1965 was reauthorized by Public Law 100-297 (the Hawkins-Stafford Elementary and Secondary School Improvement Amendments of 1988) as Title II Part A–Dwight D. Eisenhower Mathematics and Science Education Act. This grant, termed Title II in this report, provides federal funds for the improvement of mathematics and science teaching at all levels of primary and secondary education (pre-K through 12). The purpose of Title II is to improve the skills of teachers and the quality of instruction in mathematics and science and to increase the access of all students to such instruction. In 1993-94, AISD received $206,662 from Title II funds, plus $138,133 in carryover funds, for a total of $344,795.

The project provided:

- Staff development workshops,
- Funds for teachers to attend professional conferences,
- Salary for a mathematics specialist to focus on middle school mathematics staff development, and
- Funds for a consultant to evaluate 1993-94 Title II-funded projects.

Major Findings

1. A total of 1,034 AISD staff members attended workshops and/or conferences sponsored with Title II funds during the 1993-94 school year (p. 4).
2. There was a 10.1% increase from 1992-93 in male participation in Title II activities (p. 4).
3. A total of 832 AISD staff members, at all levels, participated in a variety of workshop topics that were sponsored with Title II funds throughout the 1993-94 school year. This level of participation is a 133% increase over 1992-93 workshop participation (357 participants) (p. 5).
4. A total of 201 AISD staff members, assisted with Title II funds, attended mathematics and/or science conferences, an increase of 48.8% from 1992-93 conference participation (p. 8).
5. A mathematics specialist was hired to address District concerns with middle/junior high school mathematics underachievement. Beginning in January 1994, the mathematics specialist conducted two phases of training for all middle school mathematics teachers that concentrated on the implementation of national standards and alternative mathematics assessment techniques (p. 10).

Budget Implications

Mandate: External funding agency

Funding Amount: $344,795 (1993-94 allocation of $206,662 and $138,133 carryover)

Funding Source: Federal

Implications: The Title II grant has provided funding to AISD to enhance mathematics and/or science teacher instruction. Title II activities target the District's fifth strategic objective which is part of an overall strategy for ongoing professional development. The activities indirectly target the District's first strategic objective which focuses on motivating student learning and achievement. The objective of Title II training is to improve the skills of teachers and the quality of instruction in mathematics and science and to increase the access of all students to such instruction.

Recommendations

Based on the present evaluation findings, the following recommendations are offered:

- Continue funding staff development training,
- Continue funding participation in professional conferences,
- Continue funding the mathematics specialist to address middle school mathematics underachievement,
- Continue encouraging minority teachers of mathematics and science to participate in staff development and professional conferences,
- Use Title II funds to supplement recruiting of minority teachers of mathematics and science, and
- Use Title II funds for the coordination of staff development training with District staff development.

PROGRAM EFFECTIVENESS SUMMARY

1993-94 TITLE II
MATHEMATICS AND SCIENCE TEACHER TRAINING

PROGRAM	ALLOCATION (COST)*	NUMBER OF TEACHERS SERVED**	COST PER TEACHER	EVIDENCE	RATING
Elemantary Mathematics and Sciance Grades: K-5	$71,838	448	$160	Rating based on meeting grant objectivas	+
Middle School Mathemetics Grades: 6-8	$21,883	198	$110	Reting based on meeting grant objectives	+
Middle School Science Grades: 6-8	$11,977	21	$570	Rating basad on meeting grant objectives	+
High School Mathematics Grades: 9-12	$8,480	15	$565	Rating based on meeting grant objectives	+
High School Science Grades: 9-12	$25,959	163	$159	Rating based on meeting grant objectives	+
Middle School Mathematics Specialist Grades: 6-8	$51,825	98	$529	Rating based on meeting grant objectives	+

* A total of $146,857 was appropriated for supplies and materials, contracted services, indirect costs, and operating expenses.

** Nine (9) participants were administrators; 12 participants were not located in the AISD master file. Information on these participants is unknown.

Rating is expressed as contributing to any of the five AISD strategic objectivea.

- \+ *Positive*,needs to be kept and expanded
- 0 *Not significant*, needs to be improved and modified
- \- *Negative*, needs major modification or replacement
- Blank *Unknown*, may have positive or negative

Cost is the expense over the regular District per student expenditure of about $4,000.

- 0 *No cost* or minimal cost
- $ *Indirect costs* and overhead, but no separate budget
- $$ *Some direct costs*, but under $500 per student
- $$$ *Major direct costs* for teachers, staff, and/or equipment in the range of $500 per student

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CONCLUSION

Insofar as can be determined, it appears that Title II funds were used effectively to improve mathematics and science teaching. Overall, AISD staff participation increased from a total of 468 participants during 1992-93 to a total of 1,034 participants during 1993-94 (a 121% increase). Additionally, there was a 10.1% increase in male participation from 1992-93.

It appears that the objectives of training teachers on current technology, teaching techniques, science assessment techniques, and student learning activities have been met. A variety of workshop topics were sponsored with Title II funds for all levels of AISD staff throughout the 1993-94 school year, and a total of 832 AISD staff members participated. This level of participation is more than double the 1992-93 workshop participation (357 participants, a 133% increase). Additionally, a total of 201 participants attended mathematics and/or science conferences using Title II funds (an increase of 48.8% from the total of 1992-93 conference participants).

In keeping with the District's 1993-94 goal of focusing on student outcomes in grades 6 through 9, a mathematics specialist was hired to support mathematics staff development for middle/junior high school teachers. Beginning in January 1994, the mathematics specialist concentrated on training all middle school mathematics teachers to implement the National Council of Teachers of Mathematics (NCTM) national standards and the NCTM suggested teaching strategies and alternative mathematics assessment techniques.

EVALUATION OVERVIEW

Data for the evaluation of Title II-funded projects were obtained from the following sources.

- Workshop sign-in sheets provided information to obtain demographic details on workshop participants;
- Copies of purchase requisitions provided information to obtain demographic details on conference participants;
- AISD instructional coordinators provided information on conference and workshop subjects and dates, information on conference attendance, and purchases of materials for staff development purposes;
- The mathematics specialist provided information on workshop subjects, content, dates, staff attendance, purchases of materials for staff development purposes, and philosophical approach for focusing on middle school staff development; and
- Curriculum and Evaluation Standards for School Mathematics (1989) provided information on the rationale, intent, and suggested teaching and evaluation strategies of the national mathematics standards developed for grades 5-8 by the National Council of Teachers of Mathematics (NCTM).

INTRODUCTION

Title II of the Elementary and Secondary Education Act (ESEA) of 1965, reauthorized by Public Law 100-297 (the Hawkins-Stafford Elementary and Secondary School Improvement Amendments of 1988) as Title II Part A--Dwight D. Eisenhower Mathematics and Science Education Act, provides federal assistance to state and local education agencies for improving the skills and the quality of mathematics and science instruction and to increase the access of all students to such instruction. The Act's intent is to promote excellence in American mathematics, science, and engineering education, thereby strengthening the economic competitiveness and national security of the United States.

For the sake of convenience and continuity with past reports, this report will refer to AISD's program simply as Title II.

Title II funds are used for training mathematics and science instructors as well as to enrich existing curricula. According to P.L. 100-297, local education agencies (school districts) may use federal Title II funds for the following purposes:

1. Expansion and improvement of preservice and inservice training for teachers and other appropriate school staff,

2. Recruitment or retraining of minority teachers to become mathematics and/or science teachers,

3. Training in the instructional use of computers, video, and other telecommunications technologies as part of a mathematics and/or science program, after all other training needs have been met,

4. Integrating higher order analytical and problem-solving skills into the mathematics and/or science curriculum, and

5. Grants for individual teachers to improve either their teaching ability or the instructional materials they use in their mathematics and/or science classrooms.

From July 1993 through June 1994, AISD received $344,795 (1993-94 allocation of $206,662 and $138,133 carryover) from federal Title II funds to provide:

- Staff development workshops to acquaint teachers with the latest developments in instructional and assessment techniques in their field,

- Funds for teachers to attend professional conferences providing teacher involvement and continued learning within their profession,

- Salary for a mathematics specialist to focus on staff development projects aimed at improving mathematics achievement in grades 6-8, and

- Funds for a consultant to evaluate 1993-94 Title II-funded projects.

In the 1993-94 school year, Title II funds were targeted to serve elementary, middle school, and high school teachers of mathematics and science with specific goals to:

1. Supplement District efforts to improve mathematics and science instruction for all students in grades 6-9,

2. Provide ongoing districtwide training for teachers to become aware of new instructional and assessment techniques, to use hands-on materials appropriately, and to have ongoing opportunities for self-improvement, and

3. Modify the existing mathematics and science curricula by integrating higher order analytical and problem-solving skills.

AISD's use of Title II funds has focused on mathematics and science teacher training in basic knowledge of concepts and processes, science performance assessment, the use of modern technology, and the use of innovative instructional approaches to enhance higher order thinking skills and learning. Title II-funded projects are intended ultimately to impact student interest, involvement, and learning in the areas of mathematics and science.

Figure 1 shows the configuration of 1993-94 Title II-funded components by grade span (elementary--grades K-6, middle/junior high school--grades 6-8, and high school--grades 9-12) of AISD staff participants.

FIGURE 1
ELEMENTS OF 1993-94
TITLE II PARTICIPATION

TITLE II COMPONENT	ELEMENTARY SCHOOL	MIDDLE SCHOOL	HIGH SCHOOL	ADMINISTRATION/ OTHER	TOTAL
Workshops	324	246	146	77	793
Conferences	134	39	44	24	241
TOTAL*	458	285	190	101	1,034

* Twelve (12) Title II-funded participants could not be located in the AISD employee master file. Demographic information on these participants is unknown.

Compared to the 1992-93 school year, participation in 1993-94 Title II-funded activities increased almost 121%--from a total of 468 teachers and administrators during 1992-93 to 1,034 teachers and administrators during 1993-94.

WORKSHOPS AND CONFERENCES

DEMOGRAPHICS

A total of 1,046 teachers and administrators attended Title II-funded activities. Most participants were White, female, elementary teachers; however, there was a percentage increase (from 1992-93) in participation by males and African American staff.

A total of 1,046 staff members attended workshops and/or conferences sponsored with Title II funds during the 1993-94 school year; however, 12 Title II-funded participants could not be located in the AISD employee master file. Demographic information on these 12 participants is therefore unknown.

Some of the staff members participated in more than one activity. Figures 2 and 3 display demographic information on the identified participants. More than two thirds (72.2%) of the participants were White, almost one in five (17.2%) was Hispanic, a small percentage (10.0%) were African American, and a very small percentage (.6%) were identified as "Other." Although most (76.5%) of the participants were female, there was a 10.1% increase in male participation from 1992-93.

FIGURE 2
ETHNICITY OF 1993-94 TITLE II
WORKSHOP AND CONFERENCE PARTICIPANTS

ETHNICITY	ELEMENTARY	MIDDLE SCHOOL	HIGH SCHOOL	ADMIN/ OTHER	TOTAL
White	310	214	147	76	747
African American	56	23	15	9	103
Hispanic	90	46	26	16	178
Other	2	2	2	0	6
TOTAL*	458	285	190	101	1,034

FIGURE 3
SEX OF 1993-94 TITLE II
WORKSHOP AND CONFERENCE PARTICIPANTS

SEX	ELEMENTARY	MIDDLE SCHOOL	HIGH SCHOOL	ADMINISTRATIVE/ OTHER	TOTAL
Male	44	79	83	37	243
Female	414	206	107	64	791
TOTAL*	458	285	190	101	1,034

* Twelve (12) participants were not located in the AISD employee master file. Information on these participants is unknown.

WORKSHOPS

A variety of workshop topics were sponsored for various levels of AISD staff throughout the 1993-94 school year with Title II funds. Workshops focused on keeping teachers current with state and national standards for instruction and assessment within their domains, as well as introducing them to innovative techniques.

Because of current developments in instructional theory, methods, and techniques, and because of the turnover of mathematics and science teachers, there is a continuing need for training and retraining in the mathematics and science areas. Staff development workshops assist in keeping teachers current on instructional models, teaching techniques, and performance assessment in their field. Staff development workshops also introduce innovative materials and equipment with correspondingly fresh instructional and assessment techniques which emphasize the students' use of higher order analytical and problem-solving skills. Figure 4 displays the Title II-sponsored workshop titles and dates.

During the 1993-94 school year, supported with Title II funds, a total of 793 participants attended mathematics or science staff development workshops. This year's participation is more than double the number of 1992-93 known workshop participants (357). During the funded school year (1993-94), an individual staff member may have participated in more than one workshop.

All workshops were organized by AISD instructional coordinators or the mathematics specialist. Leaders of the workshops were instructional coordinators, the mathematics specialist, consultants, or AISD teachers who were identified by instructional coordinators as individuals who are highly effective, knowledgeable, and creative in teaching mathematics or science. All of the workshops were held at AISD schools or the AISD Read Instructional Center.

Of the total 793 workshop participants, 324 (40.9%) participants were elementary teachers, 246 (31%) were middle/junior high school teachers, 146 (18.4%) were high school teachers, and 77 (9.7%) were administrators/others (see Figure 5).

FIGURE 4
1993-94 TITLE II
MATHEMATICS AND SCIENCE WORKSHOPS

WORKSHOP	DATE
Performance-based Assessment in Science: Writing Practice Assessment for TAAS	July 7 & 8, 1993
Biology I Institute	September 22 & 23, 1993 October 13 & 14, 1993 October 27 & 28, 1993
Voyage of the Mimi	September 22, 1993
Calculator Workshop	October 28, 1993
Pattern, Relations & Functions	December 8 & 9, 1993
Problem-Solving, Middle School Mathematics	January 7 & 8, 1994
Algebra 6 - 12	February 18 & 19, 1994
Graphing Calculator	March 10, 1994
Math Their Way	June 7, 8 & 9, 1994
Hands on Equations	June 7, 8, & 9, 1994
Used Numbers: Grades 2-3	June 7, 1994
Used Numbers: Grades 4-5	June 8, 1994
Mathaholics Anonymous	June 7, 8 & 9, 1994 June 14, 15 & 16, 1994 June 28, 29 & 30, 1994
Science Leadership Institute	June 20-21, 1994
AIMS Education	June 20-24, 1994
Making Math Memorable	June 20-24, 1994

FIGURE 5
PARTICIPANTS OF 1993-94 TITLE II
MATHEMATICS AND SCIENCE WORKSHOP PARTICIPATION

WORKSHOP	ELEM	MS	HS	OTHER	TOTAL
Performance-based Assessment in Science: Writing Practice Assessment for TAAS	15	4	0	1	20
Biology I Institute	3	0	131	16	150
Voyage of the Mimi	12	0	0	1	13
Calculator Workshop	1	9	0	2	12
Pattern, Relations & Functions	0	15	0	3	18
Problem-Solving, Middle School Mathematics	0	28	0	7	35
Algebra 6 - 12	2	32	4	10	48
Graphing Calculator	0	10	1	5	16
Math Their Way	47	0	0	0	47
Hands on Equations	133	0	0	2	135
Used Numbers: Grades 2-3	30	0	0	0	30
Used Numbers: Grades 4-5	46	0	0	1	47
Mathaholics Anonymous	32	32	0	2	68
Science Leadership Institute	21	3	5	2	31
AIMS Education	2	0	0	0	2
Making Math Memorable	5	0	0	1	6
National Standards and Instructional Strategies for Middle School Mathematics (see section on Mathematics Specialist)	1	58	5	13	82
Alternative Assessment for Middle School Mathematic (see section on Mathematics Specialist)	1	58	5	13	82
TOTAL	323	246	146	78	793

ELEM = Elementary school teachers MS = Middle school teachers HS = High school teachers OTHER = Administrators/Other

Twelve (12) participants were not located in the AISD employee master file. Information on these participants is unknown.

CONFERENCES

A total of 201 participants attended mathematics and/or science conferences to learn the latest developments in their fields. This total is a 48.8% increase from the number of 1992-93 Title II conference participants.

The purpose of conference participation is to expose teachers and administrators to the latest developments in mathematics/science instructional techniques and knowledge. Because out-of-town conferences may restrict conference attendance, many conference attenders share and disseminate their acquired information with colleagues. Figure 6 displays conference titles and dates that participants attended.

FIGURE 6
1993-94 TITLE II
MATHEMATICS AND SCIENCE CONFERENCES

CONFERENCE	DATE
Conference for the Advancement of Mathematics Teaching (CAMT)	August 11-13, 1993
Conference for the Advancement of Science Teaching (CAST)	November 4-6, 1993
Math Solutions	December 7-8, 1994
Assessing Authentic Assessment	February 24, 2994
Strengthening Your Math Program	March 8, 1994
Council of Teachers of Mathematics	April 13-15, 1994

Conference participants were solicited through school announcements or selected by school principals. Instructional coordinators reported that attempts were made to include a diverse population of conference participants. Conference announcements encouraged participation from all segments of teacher experience, ethnicity, and sex.

During the 1993-94 school year, supported with Title II funds, 241 participants attended mathematics or science professional conferences. Compared to the 1992-93 school year, the number of conference participants increased by 48.8% (an increase of 65 participants).

An individual staff member may have attended more than one conference. Of the total 241 conference participants, 134 (55.6%) participants were elementary teachers, 39 (16.2%) were middle/junior high school teachers, 44 (18.3%) were high school teachers, and 24 (9.9%) were administrators/others (see Figure 7 for details).

FIGURE 7
1993-94 ELEMENTS OF TITLE II
MATHEMATICS AND SCIENCE CONFERENCE PARTICIPATION

WORKSHOP	ELEM	MS	HS	OTHER	TOTAL
Conference for the Advancement of Mathematics Teaching (CAMT)	0	4	2	3	9
Conference for the Advancement of Science Teaching (CAST)	95	27	33	33	168
Math Solutions	3	0	0	0	3
Assessing Authentic Assessment	0	0	0	2	2
Strengthening Your Math Program	4	0	0	0	4
Council of Teachers of Mathematics	2	5	4	4	15
TOTAL	134	39	44	25	241

ELEM = Elementary school teachers MS = Middle school teachers HS = High school teachers OTHER = Administrators/Other

Twelve (12) participants were not located in the AISD employee master file. Information on these participants is unknown.

MATHEMATICS SPECIALIST

A mathematics specialist was hired to support mathematics staff development for middle/junior high school teachers. Beginning in January 1994, the mathematics specialist conducted two phases of training for all middle school mathematics teachers. Phase 1 concentrated on implementing the NCTM national standards and suggested teaching strategies. Phase 2 focused on alternative mathematics assessment techniques that are complementary to the NCTM standards and AISD's middle school mathematics goals.

Although AISD students generally do well in academic achievement as measured by standardized achievement tests, the 1992-93 annual report on student achievement (ORE Pub. No. 92.30) revealed that the District's lowest achievement scores (which were lower than the national average) were in mathematics at grades 6-8, reading at grade 9, and science at grades 7 and 8, with minority students especially vulnerable to achieving lower scores than White/Other. Recent research on early adolescent students' academic achievement and academic motivation indicates that grades, motivation, self-concept of ability and positive attitudes toward school seem to especially decline during the middle school years (see Anderman & Maehr, 1994, and Eccles et al., 1993, for reviews).

Because of the District's low middle school achievement scores, AISD's superintendent elected to focus on student outcomes in grades 6 through 9 in the 1993-94 District Improvement Plan. Specifically, one of the objectives targeted improvement in mathematics achievement for students in these grades. In September 1993, a "math cadre" of approximately 45 middle school mathematics teachers and administrators met to discuss goals and strategies related to mathematics achievement in the middle schools. One of the results of their meeting was an action plan for staff developments needs. The math cadre recommended that middle school mathematics staff be educated in the following teaching strategies:

- Cooperative learning,
- Authentic assessment,
- Technology,
- Manipulatives,
- Interdisciplinary teaching, and
- Writing/communicating mathematics.

To assist in meeting the needs of middle school staff development, the District used Title II grant money to hire a mathematics specialist to work with middle school mathematics teachers. The mathematics specialist began working in January 1994 with directions to:

- Work with middle/junior high school staff and administration to identify and address mathematical needs of the students and goals and objectives of the teacher,
- Design, support and/or implement appropriate supplementary staff development for jr. high/middle mathematic teachers on individual campuses and districtwide,
- Schedule supplemental staff development projects and activities,
- Work cooperatively with appropriate administrators, coordinators, and teachers,
- Attend professional meetings to enhance knowledge of curriculum, inst uction, and/or technology,
- Organize and maintain professional materials and staff development records, and
- Participate in appropriate and required meetings that enhance teacher effectiveness and student achievement.

WORKSHOPS FOR IMPLEMENTING THE NATIONAL STANDARDS

The mathematics specialist began by developing workshops for the purpose of instructing middle school mathematics teachers on:

- The recommended national standards developed by the National Council of Teachers of Mathematics (NCTM) in 1989, and
- Teaching strategies for implementing the national standards, for promoting students' motivation to learn mathematics, and for increasing student mathematic achievement.

The workshops were scheduled so that mathematics teachers from one or two selected middle schools would attend a six-hour workshop together. The workshops were usually held at the Read Instructional Center. Occasionally, workshops were held at the scheduled school or at the Carruth Administration Center. All grades 6-8 mathematics teachers and middle school principals participated. See Figure 8 for a schedule of the national standards implementation workshops.

FIGURE 8
1993-94 MIDDLE SCHOOL MATHEMATICS WORKSHOPS
ON IMPLEMENTING NATIONAL STANDARDS

DATE	MIDDLE SCHOOL(S) ATTENDING	LOCATION
Feb. 14	Mendez	Read Center
Feb. 15	Dobie, Webb	Read Center
Feb. 16	Murchison, Burnet	Read Center
Feb. 21	Crockett	Crockett
Feb. 22	Pearce, Fulmore	Read Center
Feb. 23	Lamar, Martin	Read Center
Feb. 28	Covington, Bailey	Read Center
March 2	Kealing, Porter	Read Center
March 4	O. Henry, Bedichek	Read Center
March 10	Pearce	Read Center
March 23	Fulmore	Read Center
April 6	All Middle School Principals	Carruth
April 20	Burnet	Read Center

THE NCTM NATIONAL STANDARDS

The NCTM recommends that mathematics curricula for grades 5-8 focus on a broad, concept-driven curriculum that reflects updated theories of mathematics teaching and the interrelationships between mathematics and other disciplines. To realize this curriculum, the NCTM produced a set of recommended topics, or "standards," that it believes should guide middle school mathematics teaching. The standards are not intended to be taught as a particular unit of instruction. Instead, the NCTM suggests that "learning activities should incorporate topics and ideas across standards" (Curriculum and Evaluation Standards for School Mathematics, 1989). The NCTM suggested national standards for grades 5-8 are listed in Figure 9.

FIGURE 9
NATIONAL STANDARDS
PRESENTED TO 1993-94
MIDDLE SCHOOL TEACHERS

NCTM MIDDLE SCHOOL MATHEMATICS
NATIONAL STANDARDS

1. Mathematics as problem solving
2. Mathematics as communication
3. Mathematics as reasoning
4. Mathematical connections
5. Number relationships
6. Number systems and number theory
7. Computation and estimation
8. Patterns and functions
9. Algebra
10. Statistics
11. Probability
12. Geometry
13. Measurement

In addition to introducing, or reviewing, the suggested NCTM national standards for middle school mathematics instruction, the workshops also presented instructional strategies intended to promote motivation to learn and to increase student achievement. The instructional strategies addressed in the staff development sessions for middle school mathematics teachers emphasized:

- Cooperative learning groups, and
- Individual and group interdisciplinary projects.

In developing this segment of the workshop, the mathematics specialist was guided by the "staff learning targets" developed by the math cadre in October 1993 and by suggestions from a Texas Education Agency (TEA) publication, A Guide for Improving Texas Mathematics Programs for the 1990s, that suggested ways to improve mathematics performance on the Texas Assessment of Academic Skills (TAAS). TEA offers the following approaches to help students improve performance on mathematics tests involving problem solving:

1. Teach a comprehensive mathematics program to all students.
2. Use manipulatives to develop concepts.
3. Stress the importance of the process of problem solving rather than the calculations.
4. Encourage small group, problem-solving activities.
5. Provide opportunities for students to visualize problems.
6. Stress the relevance of mathematics to students' daily lives.
7. Stress the connections within mathematics.
8. Stress the importance of estimation.
9. Have students practice problems where there is not enough information or where there is too much information.
10. Encourage multiple approaches to solving problems.
11. Convey the appreciation of mathematics as a subject.

The staff learning targets developed by the mathematics cadre and the suggestions by TEA for improving mathematics performance on the TAAS are both congruent with recommendations for teaching strategies offered by the NCTM in association with its recommended national standards. In conjunction with the middle school mathematics teacher training, supplementary mathematics materials were supplied with Chapter 2 funds and distributed to each of the 15 middle schools. Each middle school received a copy of:

- Developing Skills with Tables and Graphs,
- Math/Space Mission,
- Algebra Warmups,
- Spatial Problem Solving,
- Numbers and Words: A Problem Per Day,
- Math Mind Benders,
- Math Connections,
- Critical Thinking Activities, and
- Hands-On Algebra.

ALTERNATIVE ASSESSMENT

The second round of workshops implemented by the mathematics specialist focused on teaching middle school mathematics teachers alternative mathematics assessment techniques. These techniques concentrate on assessing students' understanding of mathematical concepts and not merely their ability to memorize formulas in order to perform isolated computations.

The alternative assessment workshops were usually conducted after school at the scheduled middle school. Two workshops were held at the Read Instructional Center. All grades 6-8 mathematics teachers participated. See Figure 10 for a detailed schedule of the alternative assessment workshops.

FIGURE 10
1993-94 MIDDLE SCHOOL MATHEMATICS WORKSHOPS
ON ALTERNATIVE ASSESSMENT

DATE	MIDDLE SCHOOL(S) ATTENDING	LOCATION
March 7	Webb	Read Center
March 8	Dobie	Read Center
March 9	Mendez	Mendez
March 23	Burnet	Burnet
April 4	Open to all AISD teachers	Galindo
April 6	Pearce	Pearce
April 11	Martin	Martin
April 21	Fulmore	Fulmore
April 25	Porter	Porter
April 27	Lamar	Lamar
April 28	Kealing	Kealing
May 2	O. Henry	O. Henry
May 3	Bedichek	Bedichek
May 4	Covington	Covington

The NCTM believes that as curriculum and instruction change, so should the means to measure and test learning. Many existing tests cannot measure student outcomes identified in the national standards such as:

- Pursuing open-ended problems and extended problem-solving projects,
- Discussing, writing, reading, and listening to mathematical ideas,
- Connecting mathematics to other subjects and to the world outside the classroom, and
- Creating experimental and theoretical models of situations involving probabilities.

The national standards suggest moving away from teaching and testing the memorization of formulas toward teaching and testing an understanding of mathematical concepts and uses. Real-world problems often require a substantial investment of time to work through the various levels of investigation. Appropriate assessment measures should attempt to address the ways in which students integrate mathematics concepts and contexts throughout the students' learning. The focus of alternative assessment is to evaluate deeper, integrative levels of student learning and should be used throughout the teaching/learning process for gathering information on which teachers can base subsequent instruction.

The alternative assessment techniques that were addressed in the staff development sessions for middle school mathematics teachers emphasized three issues:

- The use of writing tasks,
- The use of performance tasks, and
- The grading of writing and performance tasks.

Suggested activities for writing tasks included journal writing and writing explanations of mathematical concepts and processes in quizzes, test questions, and projects. The objective of writing in mathematics is to focus students' thinking on a better understanding of the subject matter and to serve as an assessment tool for teachers. The assumption is that if students can write clearly about mathematics concepts, they probably understand them.

EXAMPLE: What is the difference between the perimeter and the area of a rectangle?

EXAMPLE: How do you know that the product of 5 negative numbers is a negative number?

The purpose of a performance task is to assess what students know and what they can do. Having students do a multilevel, multitask project allows students to display their thinking and understanding of a mathematical situation and not just provide a single answer. In order to complete a mathematical performance task students must apply mathematical concepts and operations.

EXAMPLE: ***Write a quiz for classmates consisting of three problems to solve that require finding the percent of a number. Use actual information from a newspaper, magazine, or catalog to formulate your problems.***

EXAMPLE: ***Give an argument or a counterexample to support your answer to these questions:***
1. ***Are all numbers that are divisible by 9 also divisible by 3?***
2. ***Are all numbers that are divisible by 3 also divisible by 9?***

Increasing the emphasis and use of writing and performance tasks in middle school mathematics classrooms is congruent with the staff development objectives developed by the mathematics cadre in October 1993 and is also congruent with NCTM recommendations for performance evaluation and testing in connection with the national standards.

SUMMER WORKSHOPS

In addition to the two phases of workshops for all middle school teachers, the mathematics specialist also conducted three workshops in June 1994 titled "Mathaholics Anonymous." Each workshop was held at the Read Educational Center and spanned three full days (starting at 8:30 am and ending at 3:30 pm). Figure 4 provides the dates of workshops. The three-day workshop focused on applying real world mathematics problems using cooperative learning strategies and manipulatives. The purpose of the workshop was to give middle school mathematics teachers additional training in alternative and cooperative teaching strategies with the intent of making mathematics instruction more relevant and interesting to middle school mathematics students.

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Publication Number 93.14
September 1994